301 Rec'd PCT/PTO 20 DEC 1999

FORM PTO-1390 (Modified) (REV 10-95) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER: 2245-000046

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR: 09/446447

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/AU98/00484	23 June 1998	23 June 1997

TITLE OF INVENTION

STABILISING THERMALLY BENEFICIATED CARBONACEOUS MATERIAL

APPLICANT(S) FOR DO/EO/US

CONOCHIE, David Stewart

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
   - a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
   - b. ☒ has been transmitted by the International Bureau.
   - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☐ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☐ A copy of the International Search Report (PCT/ISA/210).
8. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
   - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
   - b. ☐ have been transmitted by the International Bureau.
   - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   - d. ☒ have not been made and will not be made.
9. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
10. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)). (unexecuted)
11. ☐ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).

Items 13 to 18 below concern document(s) or information included:

13. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☐ A **FIRST** preliminary amendment.
    A **SECOND** or **SUBSEQUENT** preliminary amendment.
16. ☐ A substitute specification.
17. ☐ A change of power of attorney and/or address letter.
18. ☐ Certificate of Mailing by Express Mail
19. ☒ Other items or information:

    a) Certificate of Mailing by Express Mail;
    b) Written Opinion of International Preliminary Examining Authority;
    c) International Preliminary Examination Report.

PCTUS1/REV03
(October 1997)

12-31 Rec'd PCT/PTO 20 DEC 1999

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR 09/446447	INTERNATIONAL APPLICATION NO. PCT/AU98/00484	ATTORNEY'S DOCKET NUMBER 2245-000046

20. The following fees are submitted:.

BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) : $970.00

☒ Search Report has been prepared by the EPO or JPO . . . .

☐ International preliminary examination fee paid to USPTO (37 CFR 1.482) . . . .

☐ No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)) . . . . . .

☐ Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2) paid to USPTO . . . .

☐ International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4) . . . .

CALCULATIONS — PTO USE ONLY

OIPE JC54 DEC 20 1999 PATENT & TRADEMARK OFFICE

				CALCULATIONS	PTO USE ONLY
ENTER APPROPRIATE BASIC FEE AMOUNT =				**$970.00**	
Surcharge of **$130.00** for furnishing the oath or declaration later than ☐ 20 ☒ 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).				**$130.00**	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	19 - 20 =	0	x $22.00	**$0.00**	
Independent claims	1 - 3 =	0	x $82.00	**$0.00**	
Multiple Dependent Claims **(check if applicable)**.			☐	**$0.00**	
TOTAL OF ABOVE CALCULATIONS =				**$1,100.00**	
Reduction of 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28) **(check if applicable)**. ☐				**$0.00**	
SUBTOTAL =				**$1,100.00**	
Processing fee of **$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (f)). +				**$0.00**	
TOTAL NATIONAL FEE =				**$1,100.00**	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) **(check if applicable).** ☐				**$0.00**	
TOTAL FEES ENCLOSED =				**$1,100.00**	
				Amount to be: refunded	$
				charged	$

☒ A check in the amount of **$1,100.00** to cover the above fees is enclosed.

☐ Please charge my Deposit Account No. **08-0750** in the amount of to cover the above fees. A duplicate copy of this sheet is enclosed.

☒ The Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. 08-0750. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

Gordon K. Harris, Jr.
HARNESS, DICKEY & PIERCE, P.L.C.
P.O. Box 828
Bloomfield Hills, Michigan 48303

[signature]
SIGNATURE

Gordon K. Harris, Jr.
NAME

28615
REGISTRATION NUMBER

December 20, 1999
DATE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re: Application of David S. Conochie

U.S. National Phase Entry Based on PCT International Application No. **PCT/AU98/00484, filed 23 June 1998 Under 35 U.S.C. δ 371**

For: STABILISING THERMALLY BENEFICIATED CARBONACEOUS MATERIAL

Attorney Docket No.: 2245-000046

PRELIMINARY AMENDMENT

Sir:

Prior to substantive examination of the captioned application, please amend the application, as follows:

IN THE CLAIMS

Please amend Claims 6, 11, 13 and 17, as follows:

6. (Amended) The method defined in [anyone of the preceding claims comprises] claim 1 further comprising removing heat from the packed bed in step (d) by means of circulating a working fluid through the packed bed and a coolant circuit which includes heat transfer surfaces in the packed bed.

11. (Amended) The method defined in claim 6 [comprises] further comprising controlling the temperature of the heat transfer surfaces relative to [the] a preferred oxidation temperature of the carbonaceous material to maintain a small gradient across the bed.

13. (Amended) The method defined in [any one of claims 6, 11 and 12 comprises] claim 6 further comprising controlling the temperature of the working fluid to be greater than [the] a wall temperature of the internal heat transfer surfaces and less than that of the carbonaceous material.

17. (Amended) The method defined in [any one of the preceding claims] claim 1 further [comprises] comprising pressurizing the packed bed with an externally supplied gas to a pressure of less than 20 bar.

Please add the following new claims:

18. (New) The method defined in claim 11 further comprising controlling the temperature of the working fluid to be greater than a wall temperature of the internal heat transfer surfaces and less than that of the carbonaceous material.

19. (New) The method defined in claim 12 further comprising controlling the temperature of the working fluid to be greater than a wall temperature of the internal heat transfer surfaces and less than that of the carbonaceous material.

REMARKS

his preliminary amendment removes all multiple dependencies from the claims.

Respectfully submitted,

David Stewart Conochie

Dated: December 20, 1999

By: ______________________
Gordon K. Harris, Jr.
Reg. No. 28,615
Attorney for Applicant

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GKH/jmo

STABILISING THERMALLY BENEFICIATED CARBONACEOUS MATERIAL

The present invention relates to stabilising thermally beneficiated carbonaceous material, such as coal.

The present invention relates particularly, although by no means exclusively, to stabilising coals, such as low rank coals, that have been thermally beneficiated under conditions including high temperature and pressure to increase the BTU value of the coal by removing water from the coal.

It is known that many coals are susceptible to spontaneous combustion when stored in a stockpile. The spontaneous combustion is caused by:

(i) oxidation of coal producing hot spots which drive thermal convection of air in the coal bed; and

(ii) the thermal convection of air in turn providing more oxygen for oxidation.

Compaction of stockpiles to reduce bed permeability and containment of stockpiles to minimise access to oxygen are two means of starving coals of oxygen and thereby preventing spontaneous combustion. However, compaction and containment are not practical or complete solutions in many instances.

It is also known that thermally beneficiated coals are susceptible to spontaneous combustion. In particular, the potential for spontaneous combustion is a significant issue in relation to cooling hot dewatered

coals produced in thermal beneficiation processes prior to stockpiling the coal.

There are a number of known proposals for stabilising thermally beneficiated coal, such as the proposal of Western Syncoal Company described in Australian patent application 56103/96 and the proposals in the prior art patents referred to on pages 5 to 8 of the Syncoal Australian patent application.

An object of the present invention is to provide an improved method and apparatus for stabilising thermally beneficiated coal compared to the prior art referred to in the preceding paragraph.

According to the present invention there is provided a method of stabilising a thermally beneficiated carbonaceous material which comprises:

(a) supplying a charge of the carbonaceous material at an elevated temperature, as described herein, to a process vessel to form a packed bed;

(b) cooling the carbonaceous material in the packed bed from the elevated temperature to a target temperature by indirect heat exchange;

(c) before the carbonaceous material reaches the target temperature, supplying an oxygen-containing gas to the packed bed to partially oxidise the carbonaceous material to a required degree to stabilise the carbonaceous material; and

(d) removing heat from the packed bed that is

produced by oxidation of carbonaceous material to control the temperature of the carbonaceous material during oxidation to avoid thermal runaway.

The term "thermal runaway" is understood in general terms to be a rapid uncontrolled increase in temperature, caused by oxidation of carbonaceous material generating heat and the heat increasing the rate of oxidation of carbonaceous material, which can lead to a loss of process control.

The applicant has found in experimental work on rate of oxidation and with computational fluid dynamics modelling of stockpiles based on the experimental data that for a thermally beneficiated coal of a given size distribution:

(i) the extent of oxidation of the coal;

(ii) the stockpile temperature of the coal;

are 2 variables which have the most significant impact on spontaneous combustion of the coal in a stockpile that has not been subjected to compaction or containment.

By way of explanation, Figure 1 of the accompanying drawings is one example of an experimentally derived graph of temperature and oxidation (expressed in terms of wt% oxygen added) produced by the applicant which indicates stable conditions for stockpiling thermally beneficiated coal.

As can be seen from the regime diagram of Figure 1, oxidation alone is not sufficient to provide stockpile stability unless a very high level of oxidation is used. The high level of oxidation that is required if no cooling

is used is not a practical option because it would make the product commercially unattractive.

Figure 1 indicates that, from the viewpoint of producing a commercially attractive product that can be stockpiled safely, it is necessary to cool thermally beneficiated coal to a relatively low stockpile temperature, ie target temperature.

In the context of the method of the present invention, in situations where the carbonaceous material is coal, it is preferred that the amount of oxidation, measured as the weight of oxygen supplied to the packed bed as a percentage of the total weight of the coal in the packed bed, be in the range of 0.2 to 5 wt% and that the target temperature be less than 50°C.

It is preferred particularly that the amount of oxidation be in the range of 0.5 to 3wt% and that the target temperature be less than 35°C.

The applicant has also found in experimental/design/modelling work that a combination of a working fluid circulating through the packed bed and a coolant circuit which includes heat transfer surfaces in the packed bed is an effective means of removing heat from the packed bed that is produced by oxidation of carbonaceous material.

The removal of such heat is an important consideration in order to control the temperature of the carbonaceous material to avoid thermal runaway. The mechanism of heat removal is via heat transfer from the carbonaceous material to the working fluid and then via heat transfer from the working fluid to the internal heat transfer surfaces.

The applicant has found in experimental/

design/modelling work that particularly suitable internal heat transfer surfaces are the heat exchange plates disclosed in International applications PCT/AU98/00005, PCT/AU98/00142, and PCT/AU98/00324 of the applicant and the entire disclosure in these International applications is incorporated herein by cross-reference.

The above described combination of circulating working fluid and the coolant circuit with internal heat transfer surfaces is an important feature because it enables a substantial increase in the size of the packed bed whilst maintaining high productivity when compared with known prior art proposals, such as that disclosed in the Syncoal Australian patent application, and thereby reduces significantly the capital and operating costs.

It is preferred that the working fluid be a gas.

Gases that may be used as the working gas include nitrogen, steam, SO_2, CO_2, hydrocarbons, noble gases, refrigerants, and mixtures thereof.

It is preferred that the working fluid be unreactive with the packed bed.

It is preferred that the method comprises cooling the carbonaceous material from the elevated temperature to a preferred oxidation temperature of the carbonaceous material without supplying oxygen-containing gas to the packed bed during this initial cooling step and, when the preferred oxidation temperature is reached, supplying the oxygen-containing gas to the packed bed to partially oxidise the carbonaceous material.

The temperature described by the term "preferred oxidation temperature of the carbonaceous material" is understood herein to mean the mass weighted average

temperature of the particles in the packed bed.

It is preferred that the preferred oxidation temperature of the carbonaceous material be the temperature at which the carbonaceous material can be oxidised quickly with a given partial pressure of oxygen in the oxygen-containing gas to yield a stable product, but with heat transfer conditions such that the heat released does not cause thermal runaway.

In situations where the combination of circulating working fluid and the coolant circuit with internal heat transfer surfaces is used as the means for removing heat from the packed bed generated by oxidation of carbonaceous material it is preferred that the method comprises controlling the temperature of the heat transfer surfaces relative to the preferred oxidation temperature to maintain a small gradient across the bed while maintaining high rates of heat transfer. Preferably the temperature difference is less than 40°C, more preferably less than 30°C.

In situations where the combination of circulating working fluid and the coolant circuit with internal heat transfer surfaces is used as the means for removing heat from the packed bed generated by oxidation of carbonaceous material, it is preferred that the method comprises controlling the temperature of the working fluid to be greater than the wall temperature of the internal heat transfer surfaces and less than that of the particles of carbonaceous material so that cooling of the particles is maintained. It is also noted that cooling is improved with operation of pressure.

In a situation where the carbonaceous material is thermally beneficiated coal it is preferred that the preferred oxidation temperature be in the range of 80 -

150°C.

It is preferred particularly that the preferred oxidation temperature be in the range of 100 - 150°C.

It is preferred more particularly that the preferred oxidation temperature be in the range of 100 - 120°C.

It is preferred particularly that the method comprises maintaining the temperature of the carbonaceous material at the preferred oxidation temperature or within a temperature range which includes the preferred oxidation temperature during the step of supplying the oxygen-containing gas to the packed bed.

It is preferred that, after the oxidation step is completed, the method comprises cooling the carbonaceous material to the target temperature.

It is preferred that the target temperature be less than 50°C.

It is preferred that the method further comprises pressurising the packed bed prior to or during cooling and oxidation of the carbonaceous material.

It is preferred particularly that the method comprises pressurising the packed bed with an externally supplied gas to a pressure of less than 20 bar and typically less than 10 bar.

It is preferred that the particle size of the carbonaceous material be selected so that the packed bed formed has sufficient permeability to allow movement of working fluid with reasonable pressure drop.

According to the present invention there is provided an apparatus for stabilising a thermally beneficiated carbonaceous material in accordance with the method of the present invention as described above.

The present invention is described further by way of example with reference to Figure 2 which is a schematic diagram which illustrates a preferred embodiment of the method and the apparatus of the present invention.

The following description is in the context of stabilising thermally beneficiated coal. It is noted that the present invention is not limited to this application and extends to stabilising any suitable thermally beneficiated carbonaceous material.

With reference to Figure 2, the apparatus comprises a pressure vessel 3 which is adapted to stabilise a packed bed of thermally beneficiated coal that has been discharged and supplied to the pressure vessel 3 at an elevated temperature, typically 400°C, from a thermal beneficiation process vessel (not shown).

The pressure vessel 3 may be of any suitable configuration which includes an internal assembly of heat exchange plates 5. One example of a suitable pressure vessel is the pressure vessel disclosed in International applications PCT/AU98/00005, PCT/AU98/00142 and PCT/AU98/00324 of the applicant which includes an inverted conical inlet, a cylindrical body, a conical outlet, and an assembly of vertically disposed parallel heat transfer plates positioned in the body and the conical outlet.

The heat exchange plates 5 form part of a coolant circuit which circulates a small volume of a coolant suitable for -20°C to 140°C operation through the plates 5 in a closed circuit.

The coolant circuit also includes a cooling tower 7 which comprises an exchanger tube bank 9 positioned in the tower, a variable speed fan 11 that induces an updraft flow of air past the exchanger tube bank 9, and an evaporative system which includes nozzles 23 positioned to spray water onto the exchanger tube bank 9 and a pump 15 which pumps water from a reservoir in the base of the tower to the nozzles 23. It is noted that in cold climates the evaporative system may not be required.

The coolant circuit also includes a chiller 61 for further cooling coolant from the cooling tower 9 by heat exchange in a heat exchanger 13.

The coolant circuit also includes an expansion chamber 21 to accommodate pressure variations in the coolant circuit.

The apparatus further comprises a system, generally identified by the numeral 17, for supplying and thereafter circulating a working fluid, typically a gas such as nitrogen, through the packed bed in the process vessel 3 for pressurising and enhancing heat exchange between the coolant flowing through the plates 5 and the coal in the packed bed. The working fluid system 17 includes an inlet 19 for working fluid in the base of the process vessel 3, an outlet 25 in the top wall of the process vessel 3, a line 29 which connects the inlet/outlet 19/25 and fan 27 which circulates the working fluid through the packed bed and the line 29. The working fluid system 17 is described in more detail in International application PCT/AU98/00142 of the applicant.

The apparatus further comprises a means for supplying an oxygen-containing gas to the packed bed 3 to oxidise the thermally beneficiated coal. In the embodiment

shown in Figure 2, the oxygen-containing gas is supplied to the working fluid inlet 19.

In use of the apparatus shown in Figure 2, a hot charge of thermally beneficiated coal (typically at a temperature above 300°C) is supplied to the process vessel 3 to form a packed bed, the solids inlet outlet valve (not shown) is then closed, the working fluid is supplied via inlet 19 to fill the packed bed, and the working fluid fan 27 is turned on to circulate the working fluid through the packed bed.

In the preferred embodiment of the method, the coolant circuit pump runs continuously - although at this initial stage of operation the cooling tower fan 11 and the water pump 15 are switched off.

Under these conditions, the pressure and the temperature of the coolant rises, with expansion and pressure in the coolant circuit being controlled by the expansion chamber 21.

When the coolant temperature reaches 120°C, which indicates a mass weighted average temperature of coal in the packed bed of the order of 140°C, the cooling tower air fan 11 is switched on and the speed is varied to maintain the coolant temperature at 120°C.

Thereafter, the oxygen-containing gas is supplied to the packed bed and the system is held at a constant temperature until sufficient oxygen has been added to the packed bed to complete a required level oxidation of coal.

As indicated above, during this oxidation stage, it is important to remove heat produced by oxidation of coal from the packed bed in order to avoid thermal runaway, and the applicant has found that the combination of the

heat exchange plates 5 operating with coolant circulating through the plates in a closed circuit and circulating working fluid in the packed bed is an effective means of providing the necessary temperature control in the packed bed to achieve this objective.

The applicant has also found that it is important that the wall temperature of the heat exchange plates 5 be kept close to that of the packed bed in order to maintain a small temperature gradient across the bed. The small temperature gradient is desirable in order to reduce local variations in cooling and therefore oxidation in the packed bed.

At the completion of the addition of the oxygen-containing gas, the cooling tower fan is switched to full speed, the water pump 15 is switched on, and the temperature of the packed bed, including the coal, is driven to the target temperature, typically less than 50°C.

If required, the chiller circuit 61 is switched on to lower the coolant temperature to give a cooler product in a shorter time.

When the packed bed reaches the target temperature, the packed bed is vented through vent 62 and the cooled, stabilised, thermally beneficiated coal is discharged from the process vessel 3 and is stock piled.

Many modifications may be made to the preferred embodiment of the method and apparatus of the present invention that is described above in relation to Figure 2 without departing from the spirit and scope of the present invention.

By way of example, whilst the preferred embodiment comprises supplying the oxygen-containing gas

into the packed bed via the working fluid inlet 19 in the base of the process vessel 3, it can readily be appreciated that the present invention is not restricted to this arrangement, and it is within the scope of the present invention to introduce the oxygen-containing gas into the packed bed at any suitable location(s).

CLAIMS:

1. A method of stabilising a thermally beneficiated carbonaceous material which comprises:

(a) supplying a charge of the carbonaceous material at an elevated temperature to a process vessel to form a packed bed;

(b) cooling the carbonaceous material in the packed bed from the elevated temperature to a target temperature by indirect heat exchange;

(c) before the carbonaceous material reaches the target temperature, supplying an oxygen-containing gas to the packed bed to partially oxidise the carbonaceous material to a required degree to stabilise the carbonaceous material; and

(d) removing heat from the packed bed that is produced by oxidation of carbonaceous material to control the temperature of the carbonaceous material during oxidation to avoid thermal runaway.

2. The method defined in claim 1 wherein the required degree of oxidation in step (c), measured as the weight of oxygen supplied to the packed bed as a percentage of the total weight of the coal in the packed bed, is in the range of 0.2 to 5 wt%.

3. The method defined in claim 2 wherein the target temperature is less than 50°C.

4. The method defined in claim 2 wherein the

required degree of oxidation is in the range of 0.5 to 3wt%.

5. The method defined in claim 4 wherein the target temperature is less than 35°C.

6. The method defined in any one of the preceding claims comprises removing heat from the packed bed in step (d) by means of circulating a working fluid through the packed bed and a coolant circuit which includes heat transfer surfaces in the packed bed.

7. The method defined in claim 6 wherein the working fluid is a gas.

8. The method defined in claim 7 wherein step (b) comprises a first stage of cooling the carbonaceous material from the elevated temperature to a preferred oxidation temperature of the carbonaceous material without supplying oxygen-containing gas to the packed bed during this initial cooling stage.

9. The method defined in claim 8 wherein step (c) comprises supplying the oxygen-containing gas to the packed bed to partially oxidise the carbonaceous material when the carbonaceous material reaches the preferred oxidation temperature.

10. The method defined in claim 9 wherein, after partial oxidation step (c) is completed, step (b) comprises a second stage of cooling the carbonaceous material to the target temperature.

11. The method defined in claim 6 comprises controlling the temperature of the heat transfer surfaces relative to the preferred oxidation temperature to maintain a small gradient across the bed.

12. The method defined in claim 11 wherein the temperature difference is less than 40°C.

13. The method defined in any one of claims 6, 11 and 12 comprises controlling the temperature of the working fluid to be greater than the wall temperature of the internal heat transfer surfaces and less than that of the carbonaceous material.

14. The method defined in claim 8 wherein the preferred oxidation temperature is in the range of 80 - 150°C.

15. The method defined in claim 14 wherein the preferred oxidation temperature is in the range of 100 - 150°C.

16. The method defined in claim 14 wherein the preferred oxidation temperature is in the range of 100 - 120°C.

17. The method defined in any one of the preceding claims further comprises pressurising the packed bed with an externally supplied gas to a pressure of less than 20 bar.

09/446447

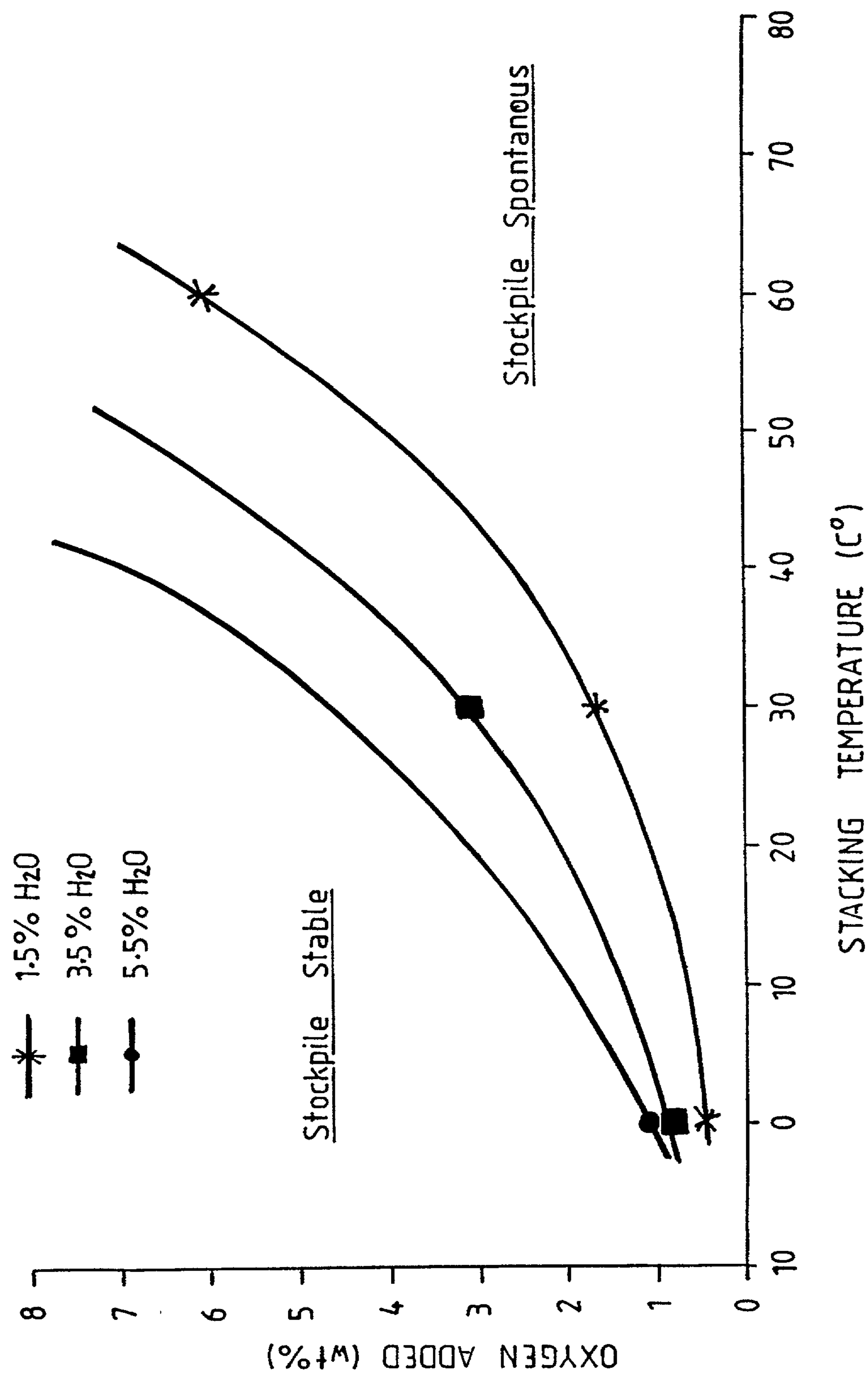

FIG. 1.

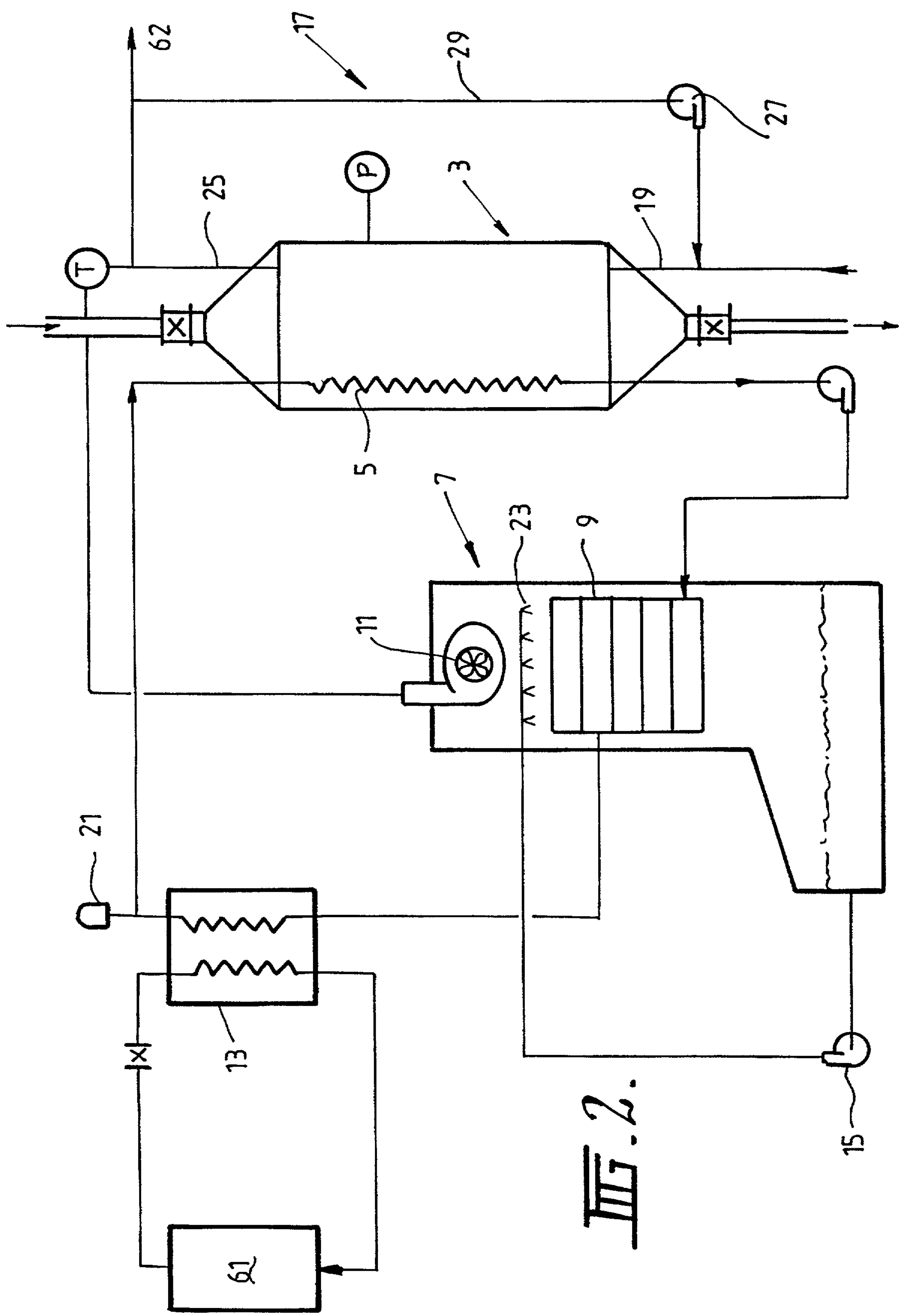

FIG. 2.

Attorney Docket No. 2245-000046

DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

STABILISING THERMALLY BENEFICIATED CARBONACEOUS MATERIAL

the specification of which (check one)

[ ] is attached hereto.

[X] was filed on December 20, 1999 as Application Serial No. 09/446,447 and was amended on ______________________ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information that is material to the patentability of the invention claimed in this application, or information that is material to the examination of this application, in accordance with Title 37, Code of Federal Regulations, section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, section 119(a)-(d) of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

PRIOR FOREIGN APPLICATION(S)

			Priority Claim	
(Number)	(Country)	(Day/Month/Year filed)	Yes	No
(Number)	(Country)	(Day/Month/Year filed)	Yes	No

DECLARATION AND POWER OF ATTORNEY

I hereby claim the benefit under Title 35, United States Code, §119(e) of any United States Provisional application(s) listed below:

PRIOR PROVISIONAL APPLICATIONS

(application serial number) (Month / Day / Year filed)

(application serial number) (Month / Day / Year filed)

I hereby claim the benefit under Title 35, United States Code, section 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, section 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, section 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

Application Serial No.	Filing Date	Status - patented, pending, abandoned
PCT/AU/98/00484	23 June 1998	Pending

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

I hereby appoint Gordon Harris, Reg. No. 28615, and each principal, attorney of counsel, associate and employee of Harness, Dickey & Pierce, P.L.C., who is a registered Patent Attorney, my attorney with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith. I request the Patent and Trademark Office to direct all correspondence and telephone calls relative to this application to Harness, Dickey & Pierce, P.L.C., P. O. Box 828, Bloomfield Hills, Michigan 48303 (248) 641-1600.

Full name of sole or first inventor: David Stewart Conochie

Inventor's signature:

Date: 9/3/2000 AUX

Residence: 27 Sunnyside Avenue, Camberwell, Victoria 3124, Australia

Citizenship: Australia

Post Office Address: same as residence